



LCD MODULE

Article No.: **AC-404AYILY-73**

40 x 4 Characters
STN yellowgreen Technology
with yellowgreen led backlight



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AMPIRE CO., LTD.

SPECIFICATIONS FOR LCD MODULE

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CUSTOMER	
CUSTOMER PART NO.	
AMPIRE PART NO.	AC-404AYILY-73
APPROVED BY	
DATE	

AMPIRE CO., LTD.

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RECORD OF REVISION

Revision Date	Page	Contents	Editor
2002/7/26	-	New Release	Patrick
2003/12/25	3	Change the IC to ST7066U	

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1 FEATURES

- (1) Display format : 40 characters × 4 lines
- (2) Construction : LCD, Black Bezel, Yellow-green LED back-light and PCB.
- (3) Display type : STN , Yellow-green mode , Transflective , 6 o'clock view.
- (4) Controller : ST0066U.
- (5) 5V single power input.
- (6) Normal temperature type.
- (7) Excellent LC : VOP maintains at 5V for whole temp. range, no need extra temp. compensation circuit.

2 MECHANICAL DATA

Parameter	Stand Value	Unit
Dot size	0.50(W) × 0.55(H)	mm
Dot pitch	0.57(W) × 0.62(H)	mm
Character size	2.78(W) × 4.89(H)	mm
Viewing area	147.0(W) × 29.5(H)	mm
Module size (LED back-light)	190.0(W) × 54.0(H) × 14.0 max (T)	mm

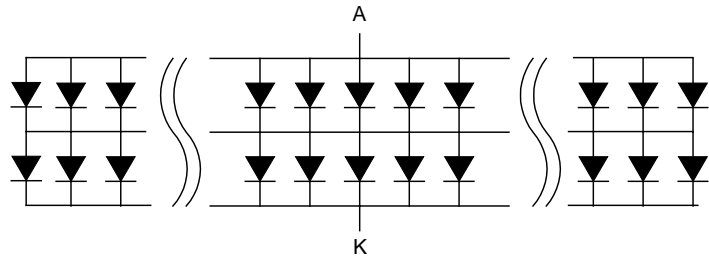
3 ABSOLUTE MAXIMUM RATINGS

Parameter	Symbol	Min	Max	Unit	
Logic Circuit Supply Voltage	VDD-VSS	-0.3	7.0	V	
LCD Driving Voltage	VDD-VO	-0.3	10.0	V	
Input Voltage	VI	-0.3	VDD+0.3	V	
Normal temp. type	Operating Temp.	TOP	0	50	°C
	Storage Temp.	TSTG	-20	70	°C

4 ELECTRO-OPTICAL CHARACTERISTICS

Parameter	Symbol	Condition	Min	Typ	Max	Unit	Note
----- Electronic Characteristics -----							
Logic Circuit Supply Voltage	VDD-VSS	--	4.5	5.0	5.5	V	
LCD Driving Voltage	VDD-VO	0 °C	4.75	5.0	5.25	V	0 ~ 50 °C for Normal Temp. type
		25 °C	4.75	5.0	5.25		
		50 °C	4.75	5.0	5.25		
Input Voltage	VIH	--	0.7 VDD	--	VDD	V	
	VIL	--	VSS	--	0.3 VDD	V	
Logic Supply Current	IDD	VDD = 5V	--	3.0	4.0	mA	
----- Optical Characteristics -----							
Contrast	CR	25°C	--	5	--		Note 1
Rise Time	tr	25°C	--	150	200	ms	Note 2
Fall Time	tf	25°C	--	150	200	ms	
Viewing Angle Range	θ f	25°C & CR≥2	--	40	--	Deg.	Note 3
	θ b		--	30	--		
	θ l		--	35	--		
	θ r		--	35	--		
Frame Frequency	fF	25°C	--	64	--	Hz	
----- LED Back-light Characteristics -----							
Forward Voltage	VF	--	--	4.1	4.3	V	Supply Voltage between A&K
Forward Current	IF	VF=4.1V	--	600	--	mA	
LCM Luminous intensity		IF=600mA	--	30	--	cd/m ²	

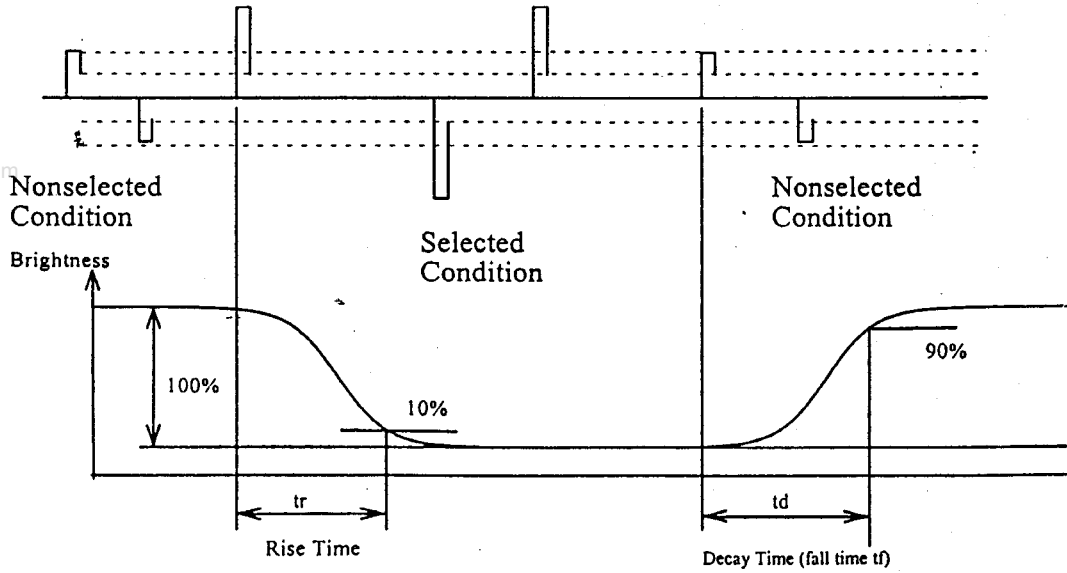
* LED Dice number = 2×60=120



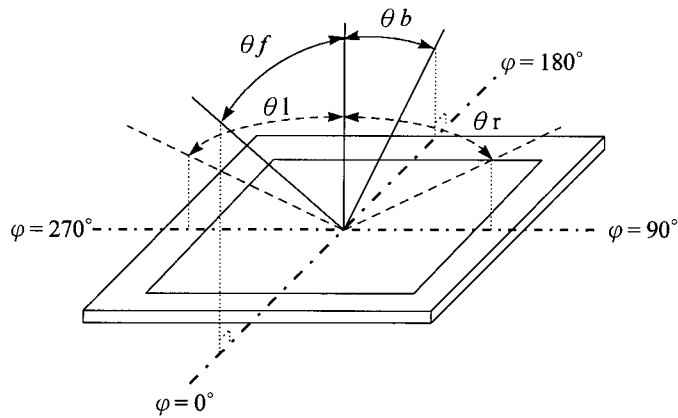
(NOTE 1) Contrast ratio :

$$CR = (\text{Brightness in OFF state}) / (\text{Brightness in ON state})$$

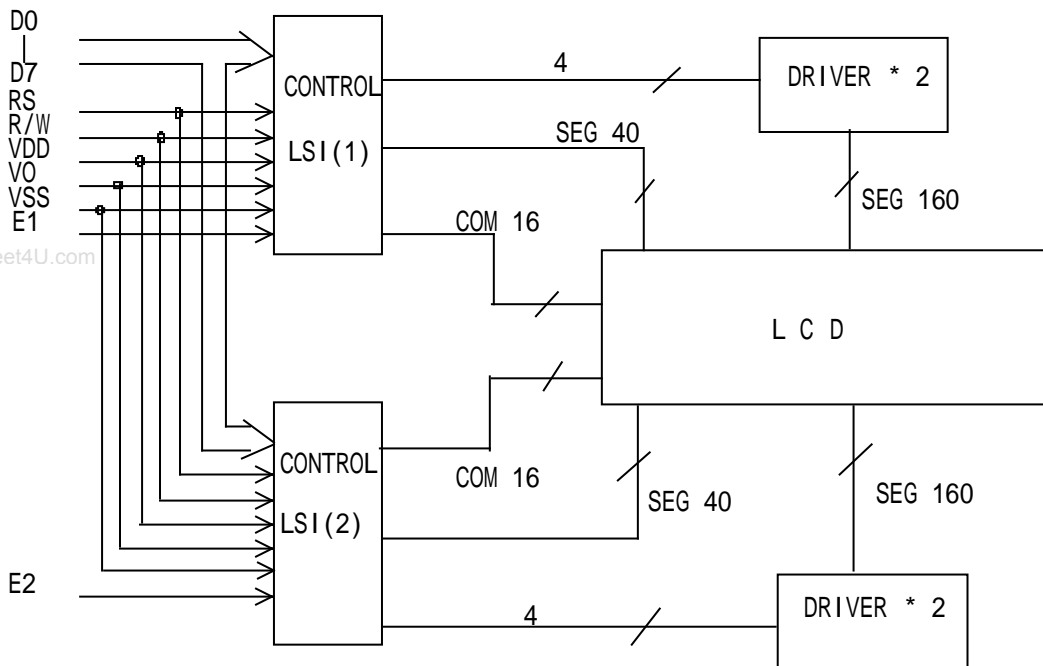
(NOTE 2) Response time :



(NOTE 3) Viewing angle

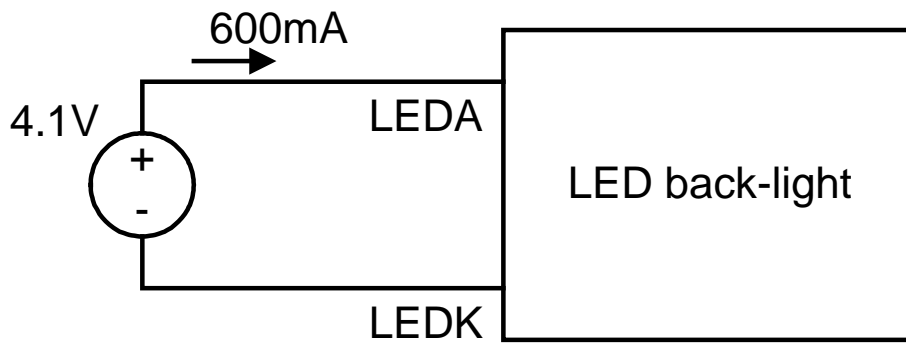
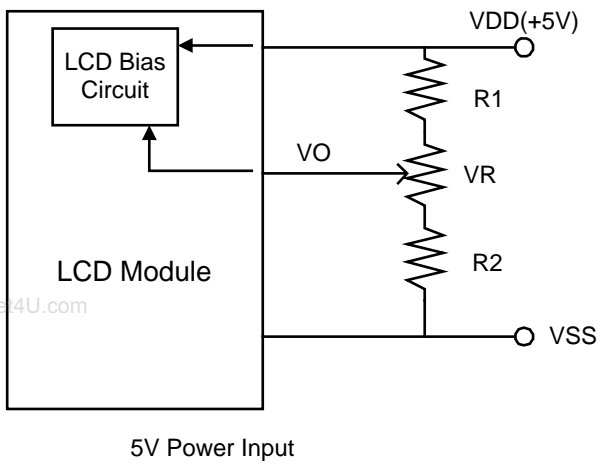


5 BLOCK DIAGRAM & INTERFACE



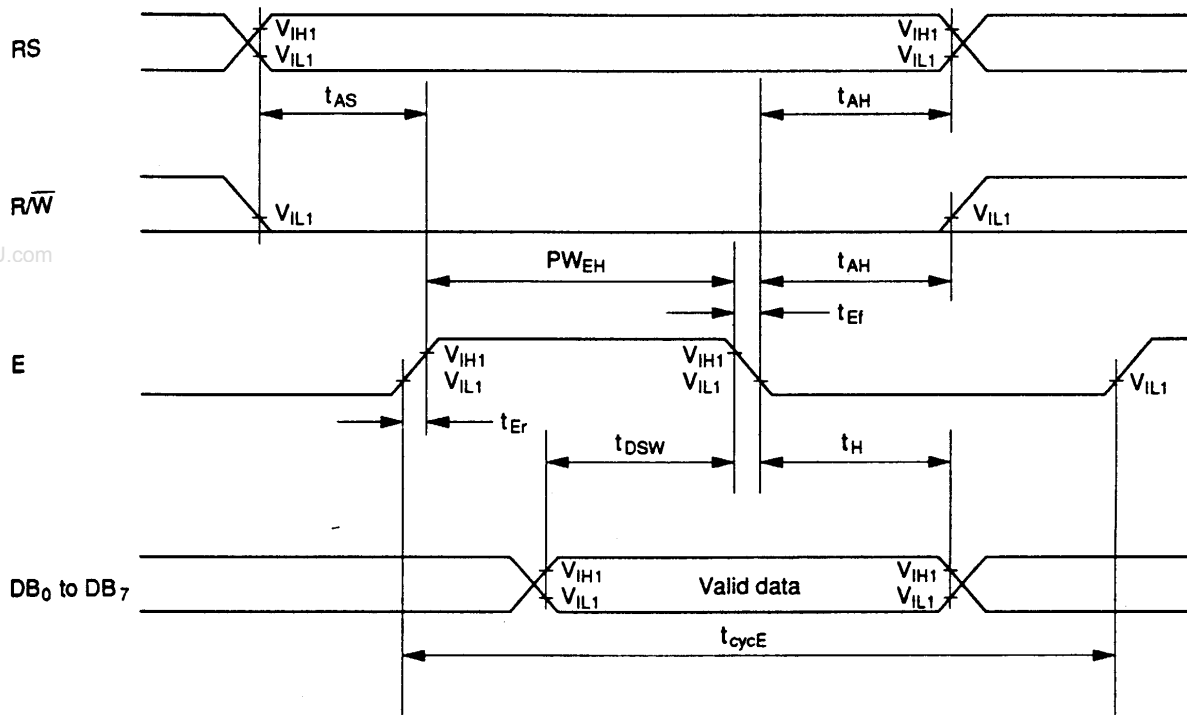
No.	Symbol	Function
1	DB7	Data Bus
2	DB6	Data Bus
3	DB5	Data Bus
4	DB4	Data Bus
5	DB3	Data Bus
6	DB2	Data Bus
7	DB1	Data Bus
8	DB0	Data Bus
9	E1	Enable Signal
10	R/W	Read/Write Select
11	RS	Data/Instruction Select
12	VO	Contrast Adjustment
13	VSS	Ground (0V)
14	VDD	Supply Voltage for Logic (+5V)
15	E2	Enable Signal (no pull-up resistor)
16	NC	No connection

6 POWER SUPPLY



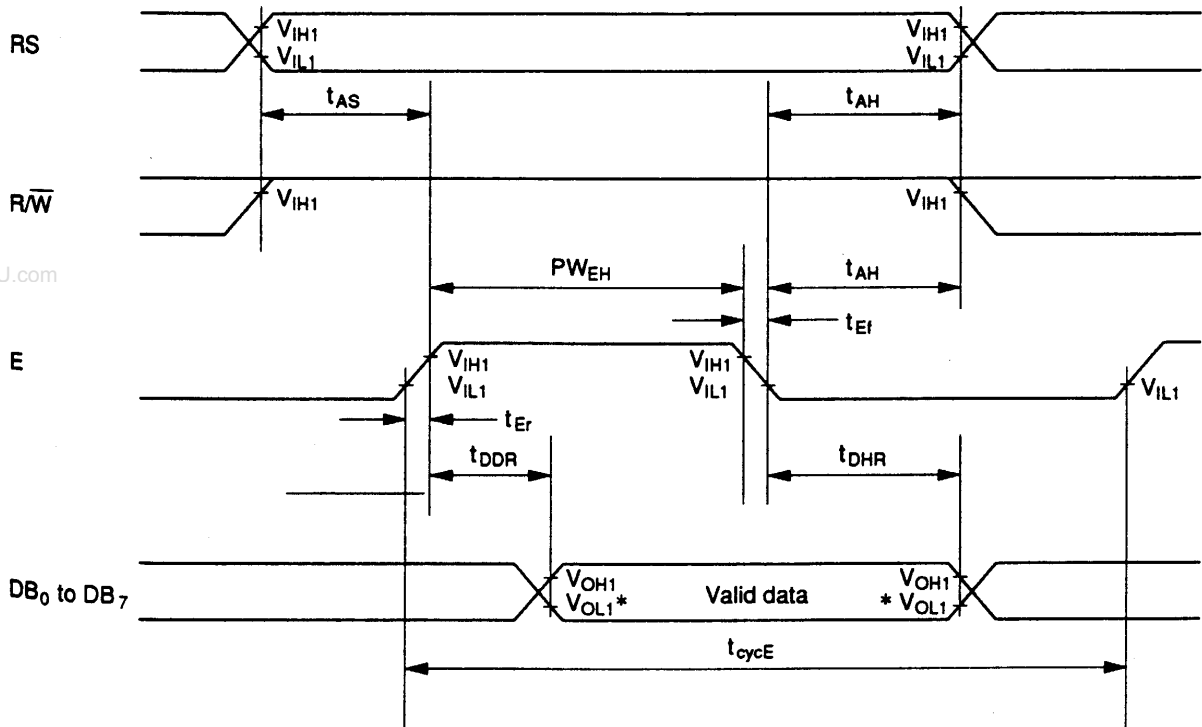
7 TIMING CHARACTERISTICS

Write Operation



Item	Symbol	Min	Typ	Max	Unit
Enable cycle time	t_{cycE}	1200	-	-	ns
Enable pulse width (high level)	PW_{EH}	140	-	-	
Enable rise/fall time	t_{Er}, t_{Ef}	-	-	25	
Address set-up time (RS, R/W to E)	t_{AS}	0	-	-	
Address hold time	t_{AH}	10	-	-	
Data set-up time	t_{Dsw}	40	-	-	
Data hold time	t_H	10	-	-	

Read Operation



Item	Symbol	Min	Typ	Max	Unit
Enable cycle time	t_{cycE}	1200	-	-	ns
Enable pulse width (high level)	$PWEH$	140	-	-	
Enable rise/fall time	t_{Er}, t_{Ef}	-	-	25	
Address set-up time (RS, R/W to E)	t_{AS}	0	-	-	
Address hold time	t_{AH}	10	-	-	
Data delay time	t_{DDR}	--	-	100	
Data hold time	t_{DHR}	10	-	-	

8 DD RAM ADDRESS

CHAR.	1	2	3	...	38	39	40
LINE 1	00	01	02	...	25	26	27
LINE 2	40	41	42	...	65	66	67
LINE 3	00	01	02	...	25	26	27
LINE 4	40	41	42	...	65	66	67

9 FONT TABLE

Upper 4bit Lower 4bit																
	LLLL	LLLH	LLHL	LLHH	LHLH	LHLH	LHHL	LHHH	HLLL	HLLH	HLHL	HLHH	HHLH	HHLH	HHHL	HHHH
LLLL	CG RAM (1)															
LLLH	(2)															
LLHL	(3)															
LLHH	(4)															
LHLH	(5)															
LHLH	(6)															
LHHL	(7)															
LHHH	(8)															
HLLL	(1)															
HLLH	(2)															
HLHL	(3)															
HLHH	(4)															
HHLH	(5)															
HHLH	(6)															
HHHL	(7)															
HHHH	(8)															

10 QUALITY AND RELIABILITY

10.1 TEST CONDITIONS

Tests should be conducted under the following conditions :

Ambient temperature : $25 \pm 5^{\circ}\text{C}$

Humidity : $60 \pm 25\% \text{ RH}$.

10.2 SAMPLING PLAN

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Sampling method shall be in accordance with MIL-STD-105E, inspection level II, normal inspection, and single sampling plan tables for normal, tightened, and reduced inspection.

10.3 ACCEPTABLE QUALITY LEVEL

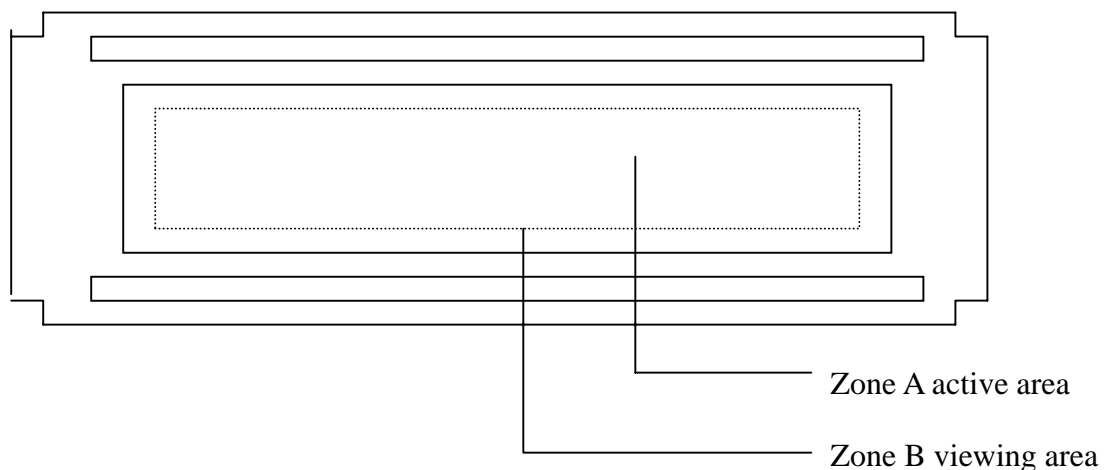
A major defect is defined as one that could cause failure to or materially reduce the usability of the unit for its intended purpose. A minor defect is one that does not materially reduce the usability of the unit for its intended purpose or is an infringement from established standards and has no significant bearing on its effective use or operation.

10.4 APPEARANCE

An appearance test should be conducted by human sight at approximately 30 cm distance from the LCD module under fluorescent light. The inspection area of LCD panel shall be within the range of following limits.

10.5 INSPECTION QUALITY CRITERIA

Item	Description of defects			Class of Defects	Acceptable level (%)
Function	Short circuit or Pattern cut			Major	0.65
Dimension	Deviation from drawings			Major	1.5
Black spots	Ave . dia . D	area A	area B	Minor	2.5
	$D \leq 0.2$	Disregard			
	$0.2 < D \leq 0.3$	3	4		
	$0.3 < D \leq 0.4$	2	3		
	$0.4 < D$	0	1		
Black lines	Width W, Length L	A	B	Minor	2.5
	$W \leq 0.03$	disregard			
	$0.03 < W \leq 0.05$	3	4		
	$0.05 < W \leq 0.07, L \leq 3.0$	1	1		
	See line criteria				
Bubbles in polarizer	Average diameter D $0.2 < D < 0.5$ mm for N = 4 , D > 0.5 for N = 1			Minor	2.5
Color uniformity	Rainbow color or newton ring.			Minor	2.5
Glass Scratches	Obvious visible damage.			Minor	2.5
Contrast ratio	See note 1			Minor	2.5
Response time	See note 2			Minor	2.5
Viewing angle	See note 3			Minor	2.5



10.6 RELIABILITY

Test Item	Test Conditions	Note
	Normal Temp. type	
High Temperature Operation	50±3°C , t=96 hrs	
Low Temperature Operation	0±3°C , t=96 hrs	
High Temperature Storage	70±3°C , t=96 hrs	1,2
Low Temperature Storage	-20±3°C , t=96 hrs	1,2
Thermal Shock Test	-20°C ~ 25°C ~ 70°C 30 m in. 5 min. 30 min. (1 cycle) Total 5 cycle	1,2
Humidity Test	40 °C, Humidity 90%, 96 hrs	1,2
Vibration Test (Packing)	Sweep frequency : 10 ~ 55 ~ 10 Hz/1min Amplitude : 0.75mm Test direction : X.Y.Z/3 axis Duration : 30min/each axis	2

Note 1 : Condensation of water is not permitted on the module.

Note 2 : The module should be inspected after 1 hour storage in normal conditions
(15-35°C , 45-65%RH).

Definitions of life end point :

- Current drain should be smaller than the specific value.
- Function of the module should be maintained.
- Appearance and display quality should not have degraded noticeably.
- Contrast ratio should be greater than 50% of the initial value.

11 HANDLING PRECAUTIONS

- (1) An LCD module is a fragile item and should not be subjected to strong mechanical shocks.
- (2) Avoid applying pressure to the module surface. This will distort the glass and cause a change in colour.
- (3) Under no circumstances should the position of the bezel tabs or their shape be modified.
- (4) Do not modify the display PCB in either shape or positioning of components.
- (5) Do not modify or move location of the zebra or heat seal connectors.
- (6) The device should only be soldered to during interfacing. Modification to other areas of the board should not be carried out.
- (7) In the event of LCD breakage and resultant leakage of fluid do not inhale, ingest or make contact with the skin. If contact is made rinse immediately.
- (8) When cleaning the module use a soft damp cloth with a mild solvent, such as Isopropyl or Ethyl alcohol. The use of water, ketone or aromatic is not permitted.
- (9) Prior to initial power up input signals should not be applied.
- (10) Protect the module against static electricity and observe appropriate anti-static precautions.

